

S E R I E S 8 H P H W E L D H E A D



U S E R ' S M A N U A L

Unpacking the Weld Head Components	2
Optional Mounting of the Series 8HPH Weld Head	3
Installing the Weld Head	4
Connecting the Extension Cable to the Weld Head	4
Connecting the Weld Head Extension Cable to the Power Supply	5
Electrode Selection and Installation	7
Inspecting the Electrode	7
Calculating Electrode Length	7
Installing or Replacing the Electrode	9
Operation	12
Preparing the Work	12
Fixturing the Work Pieces	13
Performing a Weld	16
Changing the Side Plates	18
Performing Daily Maintenance	23
Daily Fixture Maintenance	23
Daily Weld Head Maintenance	23
Performing Periodic Maintenance	24
Series 8HPH Cleaning and Inspection	24
Ceramic Insert Replacement	33
Arc Shield Replacement	34
Work Support System	35
Right/Left Work Support Instructions	35
Parts Drawings	37

Swagelok®

SERIES 8HPH WELD HEAD

Swagelok® series 8HPH (high performance) weld heads deliver consistent, precise welds for outside diameters from 1/8 to 1/2 in. and 3 to 12 mm. Designed for the rigors of the production environment and for cleanroom compliance, the series 8HPH is encased in a metal shroud. It is capable of performing up to four times as many welds as the traditional micro weld head in the same amount of time. The series 8HPH also provides the benefit of enhanced operator comfort, as the actuator handles allow the operator to fixture work pieces without touching the fixture plates.

A dc motor in the weld head drives a rotor, which revolves the tungsten electrode around the weld joint. Optical circuitry in the weld head sends precise feedback to the power supply to control the speed of the rotor. The electrode is positioned in the eight o'clock position to facilitate visual joint alignment.

A spring-loaded, floating brush maintains contact with approximately two-thirds of the circumference of the rotor. This configuration ensures consistent, uniform electrical conductance to the rotor and electrode.

This manual presents information that is specific to the high performance weld head. The weld head fixtures do not use separate collets but rather have separate side plates with integral collet features.

Formal training on the operation, fixture plate installation, and maintenance is recommended.

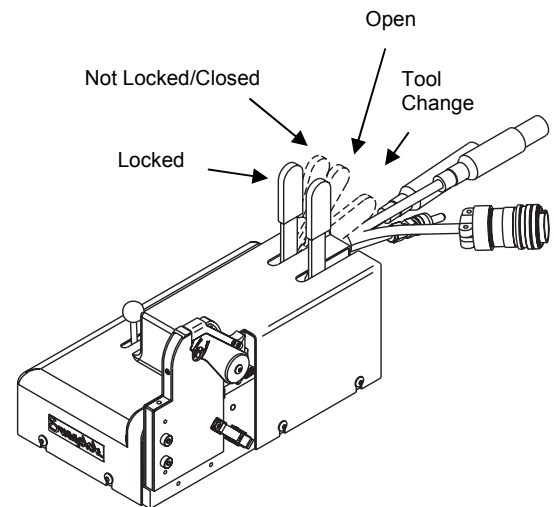


Figure 1 *Series 8HPH Weld Head*

Unpacking the Weld Head Components

The following weld head components are packaged in a foam-lined shipping container:

- weld head
- electrode package
- centering gauge
- series 8HPH tool package
- extension cable
- user's manual

The series 8HPH weld head has size-specific side plates, and the order number specifies which set will be installed upon receipt. Other side plate sizes are optional accessories. The side plate size ordered will determine the electrode package that is delivered with the weld head.

Perform the following steps when your Swagelok series 8HPH weld head arrives.

1. Inspect the container for damage.
2. Remove the components from the container.
3. Check the items for any damage.
4. Verify that the weld head serial number matches the serial number on the shipping container.
5. Record the model and serial numbers and the delivery date on the Warranty Information form.

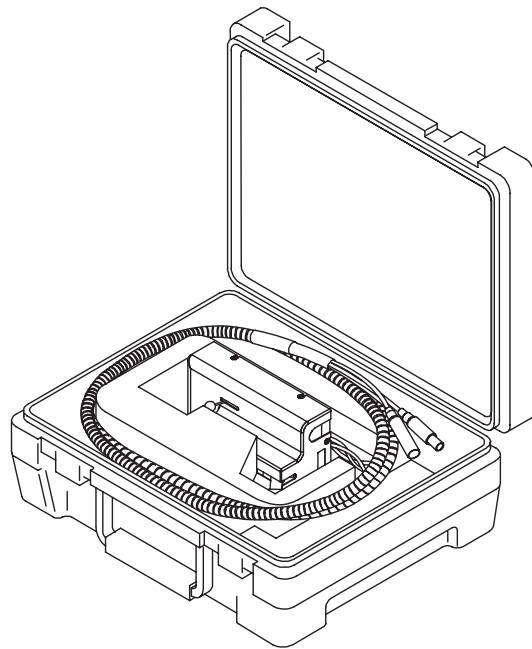


Figure 2 *Shipping Container*

Optional Mounting of the Series 8HPH Weld Head

The series 8HPH weld head comes with predrilled holes for optional bench-top mounting.

1. Determine the mounting orientation of the weld head on the workbench.
2. Use the integral mounting holes on the bottom of the unit to secure the unit to the workbench.
3. Drill holes in workbench using the dimension guide in Figure 3.



Caution!
Do not drill into the weld head. The mounting holes on the unit are a specific depth to prevent damage to internal parts.

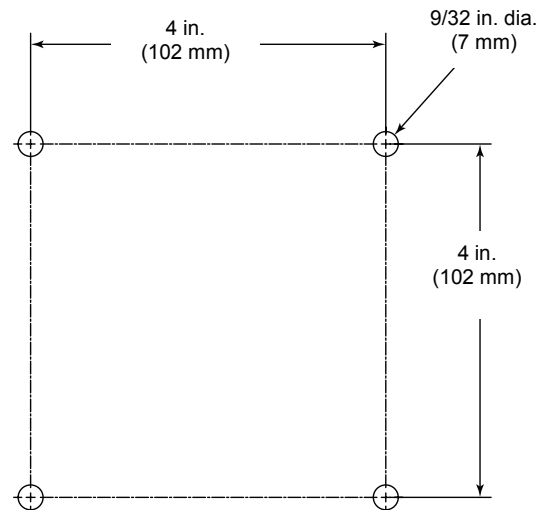


Figure 3 *Series 8HPH Mounting Dimension Guide*

4. Align holes on bottom of weld head unit to holes in workbench.
5. Insert four 1/4 in. × 20 machine screws of appropriate length (not included) through the workbench into the weld head unit. See Figure 4.

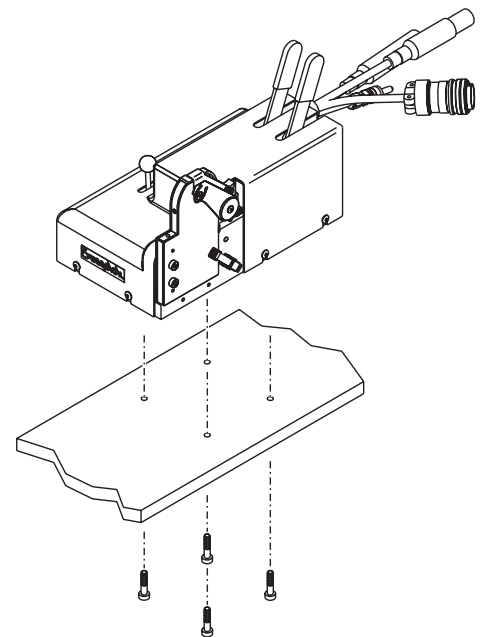


Figure 4 *Optional Mounting of the Weld Head to the Bench*

Installing the Weld Head

Connecting the Extension Cable to the Weld Head

The four connectors on the cable are:

- 1 threaded multi-pin connector
- 2 electrode (red)
- 3 work (green)
- 4 weld head shielding gas

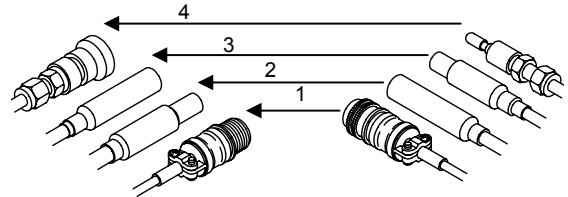


Figure 5 *Connecting the Weld Head to the Extension Cable*

1. Align the notch on the threaded multi-pin connector of the weld head cable with the small tab in the mating socket of the extension cable. Insert the threaded connector and screw on the weld head cable by turning clockwise until it is tight.
2. Align the arrow on the female socket of the weld head electrode cable (red) with the arrow on the male connector (red) of the extension cable. With the arrows aligned, insert and fully seat the red male connector of the extension cable into the red female socket of the weld head cable. Twist the connector one-quarter turn clockwise to lock into place.
3. Align the arrow on the male connector of the weld head work cable (green) with the arrow on the female socket (green) of the extension cable. With the arrows aligned, insert and fully seat the green male connector of the weld head cable into the green female socket of the extension cable. Twist the connector one-quarter turn clockwise to lock into place.
4. Insert the male shielding gas connector of the weld head cable into the female Swagelok quick-connect body of the extension cable. Align bodies and stems when coupling or uncoupling.

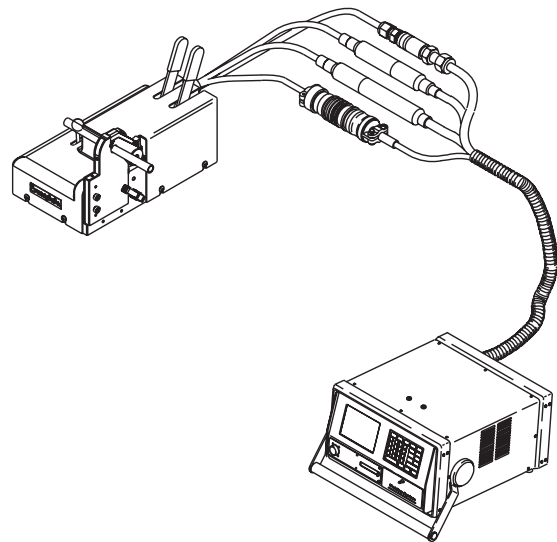


Figure 6 *Connecting the Weld Head to the Extension Cable*



Caution!
Do not rotate quick-connects while coupled. Do not insert foreign object into uncoupled bodies or stems.

Connecting the Weld Head Extension Cable to the Power Supply

The weld head extension cable has four connectors that plug into the power supply. See Figure 7.

1. Attach the threaded multi-pin connector of the extension cable to the mating socket on the rear panel of the power supply labeled **FIXTURE**. Turn the connector sleeve clockwise by hand until it is tight. This connection provides the control signals to drive the weld head.



Caution!
Ensure that the threaded multi-pin connector is fully seated in the mating socket and the threaded sleeve is tight.

2. Insert and fully seat the red connector of the extension cable into the socket on the rear panel of the power supply labeled **ELECTRODE**. Twist the connector one-quarter turn clockwise to lock into place. This connection is the negative (-) terminal of the weld head.
3. Insert and fully seat the green connector of the extension cable into the socket on the rear panel of the power supply labeled **WORK**. Twist the connector one-quarter turn clockwise to lock into place. This connection is the positive (+) terminal of the weld head.
4. Insert the shielding gas connector stem into the Swagelok quick-connect body labeled **TO WELD HEAD**.



Caution!
Ensure the connector is firmly attached. This connection provides shielding gas to the weld head through a solenoid valve in the power supply.

5. Turn the power ON. See Figure 8.

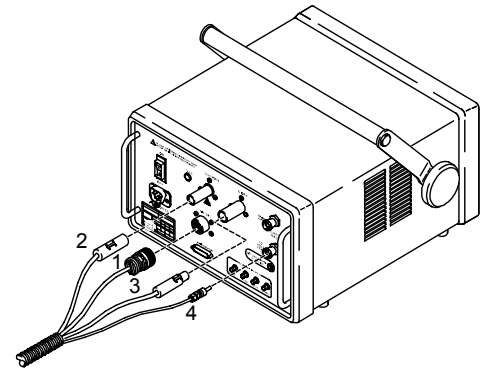


Figure 7 *Connecting the Weld Head Extension Cable to the Power Supply*

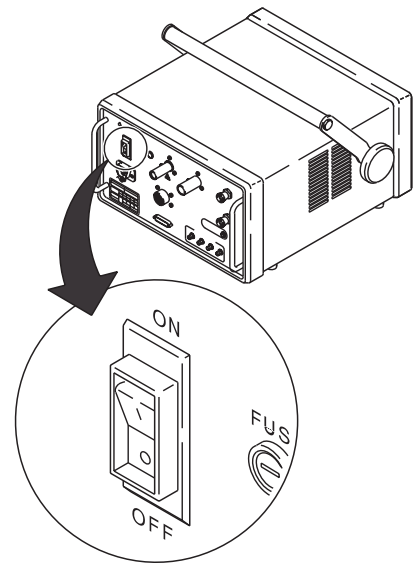


Figure 8 *Turning the Power Supply ON*

6. Press HOME to return the rotor to the home position. See Figure 9.
7. Check that the rotor returns to the appropriate home positions. See Figure 10.



Caution!
The weld head should not be started in any rotor position except home. Arc start in any other location may cause weld head damage.

8. If the rotor does not return to the home position, see the Fixture Disassembly procedure in **Performing Periodic Maintenance**.

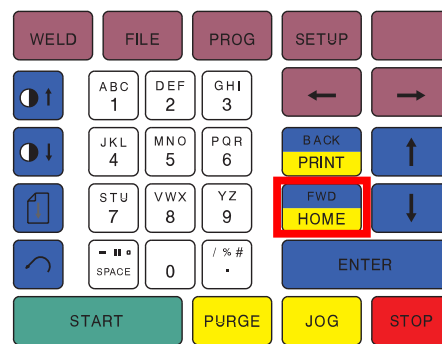


Figure 9 *Power Supply Operator Panel*

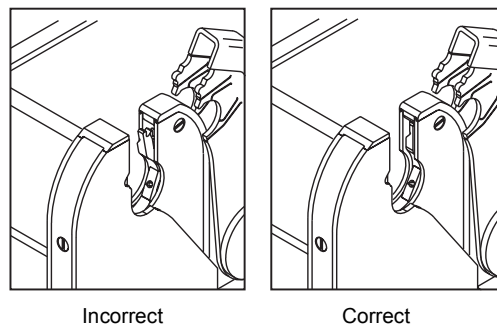


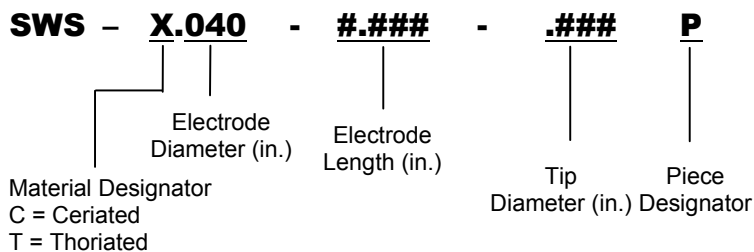
Figure 10 *Home Position of Rotor*

Electrode Selection and Installation

Inspecting the Electrode

This illustration shows the electrode shape Swagelok recommends. Properly ground electrodes provide consistent, repeatable welds. Pre-ground electrodes are available from your Swagelok sales and service representative. See Table 1 and Table 2 for ordering information. Tip diameters listed in the tables are for argon only. Other shielding gases may require different tip diameters.

The electrode ordering numbers are assigned as follows:



The ceriated electrode material type is a mixture of 98 % tungsten and 2 % cerium and is commonly referred to as “2 % ceriated.” This electrode type has demonstrated improved arc starting performance over the 2 % thoriated type, particularly when using purified shielding gas.

Calculating Electrode Length

Electrode length depends on the desired arc gap and outside diameter of the work piece being welded. The series 8HPH comes with electrodes machined to specific arc gaps. Certain electrodes will automatically be selected for inclusion with the series 8HPH when it is ordered, based on the diameter of the tubing being welded.

Electrode Length = $0.615 - [(Component\ OD) / 2] - Arc\ Gap$

Example: For a 0.500 in. component with a 0.035 in. arc gap: $0.615 - (0.500/2) - 0.035 = 0.330$ in.

This value is inserted into the Swagelok electrode ordering number as follows: SWS-C.040-.330-###-P

See your authorized Swagelok sales and service representative if custom arc gaps or tip diameters are desired, which are not listed in Table 1 or Table 2.

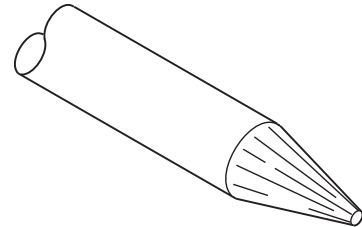


Figure 11 Tungsten Electrode



Caution!
Only ceriated tungsten should be used in the weld head. The use of other types of tungsten may cause weld head damage.

Table 1 *Series 8HPH Electrode Selection (Fractional)*

Component OD (in.)	Arc Gap (in.)	Electrode Length (in.)	Electrode Ordering Number
1/8	0.020	0.533	SWS-C.040-.533-.012-P
	0.025	0.528	SWS-C.040-.528-.012-P
	0.030	0.523	SWS-C.040-.523-.012-P
	0.035	0.518	SWS-C.040-.518-.012-P
1/4	0.025	0.465	SWS-C.040-.465-.012-P
	0.030	0.460	SWS-C.040-.460-.012-P
	0.035	0.455	SWS-C.040-.455-.012-P
	0.040	0.450	SWS-C.040-.450-.012-P
3/8	0.025	0.403	SWS-C.040-.403-.012-P
	0.030	0.398	SWS-C.040-.398-.012-P
	0.035	0.393	SWS-C.040-.393-.012-P
	0.040	0.388	SWS-C.040-.388-.012-P
1/2	0.030	0.335	SWS-C.040-.335-.012-P
	0.035	0.330	SWS-C.040-.330-.012-P
	0.040	0.325	SWS-C.040-.325-.012-P
	0.045	0.320	SWS-C.040-.320-.012-P

Note: The electrodes listed in Table 1 and Table 2 are for argon shielding gas only.

Table 2 *Series 8HPH Electrode Selection (Metric)*

Component OD (mm)	Arc Gap (mm)	Electrode Length (mm)	Electrode Ordering Number
3	0.51	13.61	SWS-C.040-.536-.012-P
	0.64	13.49	SWS-C.040-.531-.012-P
	0.76	13.36	SWS-C.040-.526-.012-P
	0.89	13.23	SWS-C.040-.521-.012-P
6	0.64	11.99	SWS-C.040-.472-.012-P
	0.76	11.86	SWS-C.040-.467-.012-P
	0.89	11.73	SWS-C.040-.462-.012-P
	1.02	11.61	SWS-C.040-.457-.012-P
8	0.64	11.00	SWS-C.040-.433-.012-P
	0.76	10.87	SWS-C.040-.428-.012-P
	0.89	10.74	SWS-C.040-.423-.012-P
	1.02	10.62	SWS-C.040-.418-.012-P
10	0.76	9.86	SWS-C.040-.388-.012-P
	0.89	9.73	SWS-C.040-.383-.012-P
	1.02	9.60	SWS-C.040-.378-.012-P
	1.14	9.47	SWS-C.040-.373-.012-P
12	0.76	8.86	SWS-C.040-.349-.012-P
	0.89	8.74	SWS-C.040-.344-.012-P
	1.02	8.61	SWS-C.040-.339-.012-P
	1.14	8.48	SWS-C.040-.334-.012-P

Installing or Replacing the Electrode

The series 8HPH weld head tool package includes:

- a miniature hex drive
- wire brushes
- tweezers
- a hex wrench set.

Use these tools for installing a new size of electrode, or for replacing the electrode when it shows signs of deterioration.

Reducing the jog speed may be helpful for correct positioning of the rotor.

1. To reduce jog speed, press SETUP on the operator panel.
2. Select CONFIG from the setup options.
3. Select a jog speed of 50 % or less.
4. Open the side plates by pushing each actuator handle back to the open position. See Figure 13.



Caution!

Do not press JOG or move the rotor unless the electrode is clamped in place.

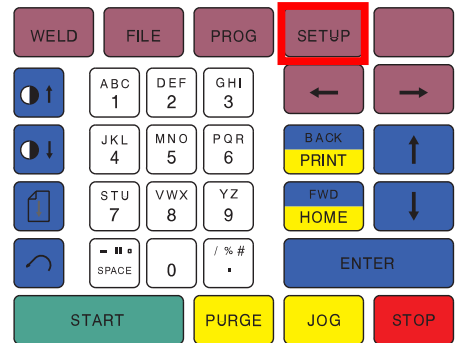


Figure 12 *Pressing SETUP on the Operator Panel*

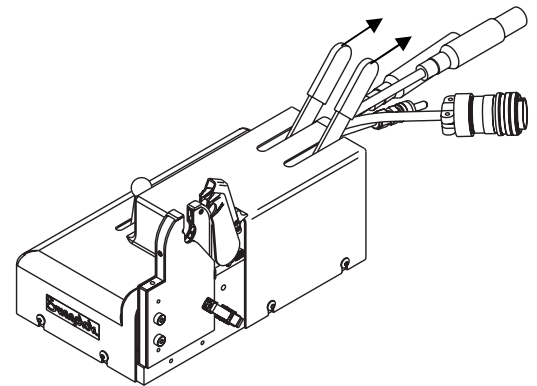


Figure 13 *Pushing Actuator Handles to the Open Position*

5. With the weld head in the open position, press **JOG** on the operator panel (see Figure 14) until the tungsten electrode is in the position shown in Figure 15.

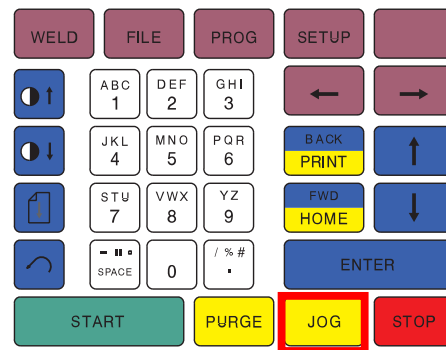


Figure 14 *Pressing JOG on the Operator Panel*

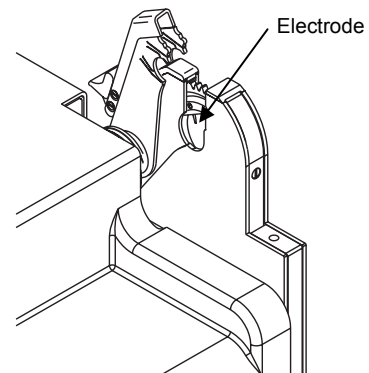


Figure 15 *Jogging the Rotor until the Electrode is Accessible*

6. Loosen the electrode set screw with the hex drive. See Figure 16.



Caution!

Hold on to the electrode with tweezers so that the electrode does not fall into the weld head gear assembly.

7. Remove and discard the old electrode.
8. Install a new electrode using the tweezers. Insert the electrode through the ceramic insulator and into the rotor to its full insertion depth. Make sure the sharp tip of the electrode is pointing out. See Figure 16.
9. Tighten the set screw sufficiently to prevent the electrode from falling out of the rotor.



Caution!

Do not overtighten the set screw, as it could damage the electrode, screw, or rotor threads.

10. Press **HOME** to return the rotor to the home position as shown in Figure 17.

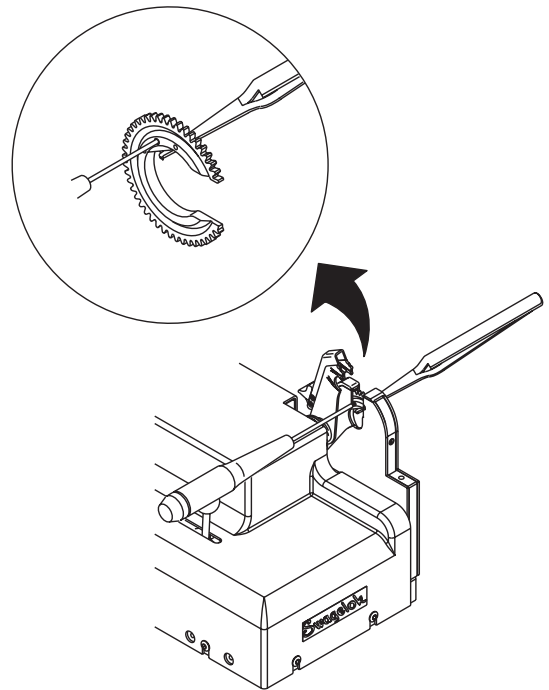


Figure 16 *Loosening the Electrode Set Screw*

Note: Replace the electrode set screw if any sign of stripping is observed.

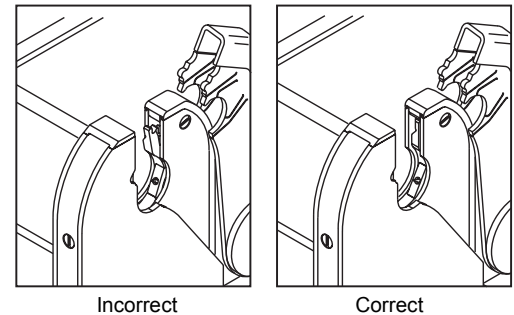


Figure 17 *Home Position of Rotor*

Operation

Preparing the Work

It is important to prepare the components properly before welding. See Figure 18. Components must be square and burr-free to ensure repeatable, high-quality autogenous fusion welds.

Follow these steps to achieve square and burr-free tubing:

1. Cut the tubing to length with a hacksaw or tube cutter.
2. Face the tube ends with a lathe or a portable facing tool.
3. Deburr the ends, making sure that both the inside and outside diameters are square and burr-free.
4. Clean the tube ends using an appropriate solvent.

Minimize the chance of a poor quality weld by following these guidelines:

- Tube ends must be square.
- Tube ends must not have a wall thickness variation exceeding $\pm 15\%$ of nominal.
- Tube ends must be burr-free.
- Tube ends must be free of any rust, grease, oil, paint, or other surface contaminants.

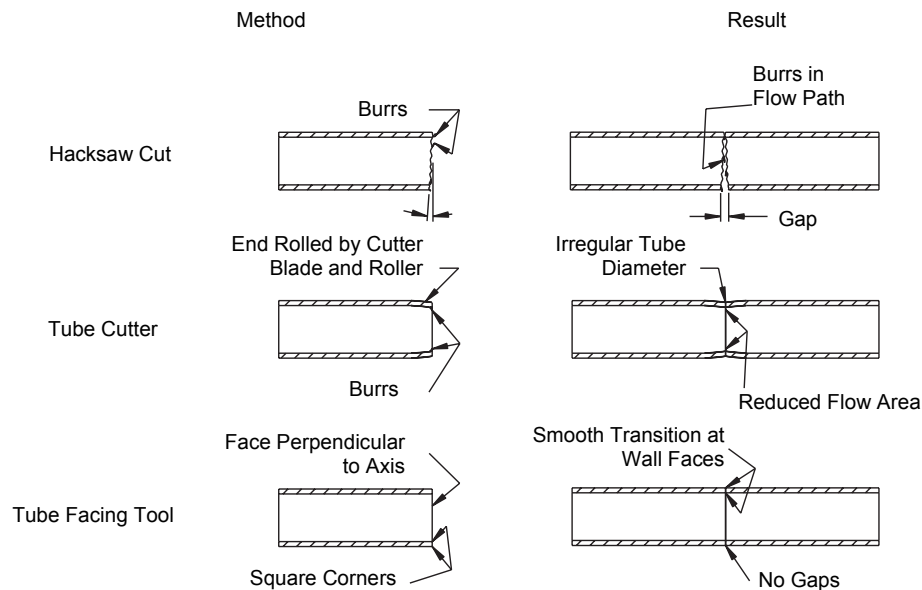


Figure 18 *Preparing the Tube*

Fixturing the Work Pieces

It is very important that the work pieces are aligned so that the electrode is in the seam of the joint, and that the ends are butted squarely. If the work pieces are out of alignment, you may experience angular or axial misalignment weld defects. See Figure 19 and Figure 20.

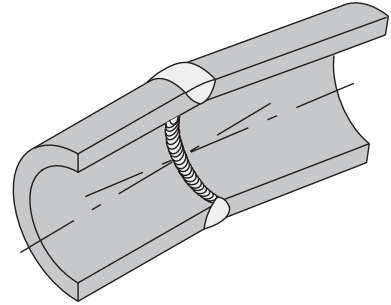


Figure 19 *Angular Misalignment*

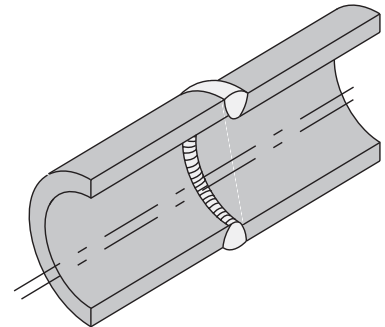


Figure 20 *Axial Misalignment*

Visual Alignment

To secure a work piece into the fixture, the user actuates the right movable clamp with the left handle. The left movable clamp is actuated in a similar fashion. See Figure 21. This method of operation allows the user to operate the fixture with one hand while holding and aligning the work piece with the other.

1. Insert the first work piece into either side of the fixture and visually align the end of the work piece with the electrode tip.
2. Clamp the work piece by placing the handle in the not locked/closed position.
3. Insert the other work piece and butt it up to the clamped work piece. Clamp the second work piece.
4. Place both handles in the locked/closed position.

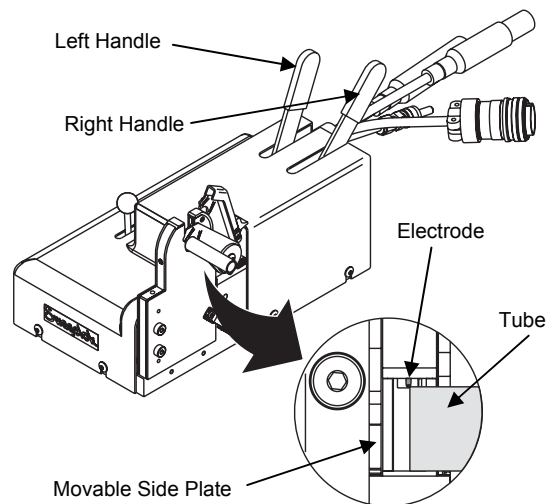


Figure 21 *Aligning the Electrode with the Tube End and Clamping the First Work Piece*

Alignment Using the Centering Gauge

The centering gauge is supplied attached to the weld head and must be adjusted before use. The following steps refer to the left movable clamp.

Note: The centering gauge can be set for use with either the left or right movable clamp.

Note: In order to use the centering gauge in the right movable clamp, the gauge must first be adjusted to work with the right movable clamp. The centering gauge adjustment procedure is the same for both the left and right movable clamps.

1. Loosen the locking screw, using the supplied hex key. See Figure 22.
2. Clamp the centering gauge around the circular surface shown in Figure 23, using the left movable clamp. See Figure 24.

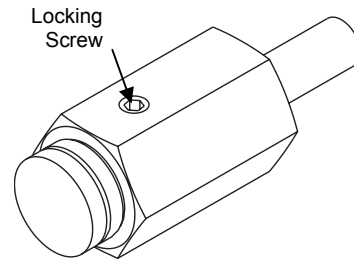


Figure 22 *Loosening the Locking Screw*

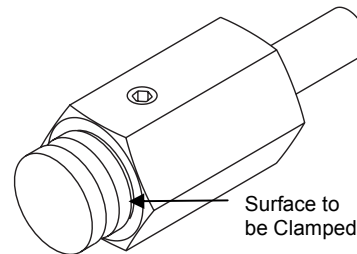


Figure 23 *Surface to be Clamped*

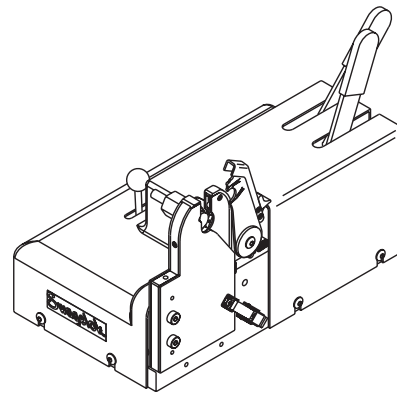


Figure 24 *Centering Gauge Clamped into Position*

3. Ensure that the centering gauge is pushed against the side plate.
4. Adjust the centering gauge so that the right edge is centered on the electrode. See Figure 25.
5. Tighten the centering gauge locking screw.

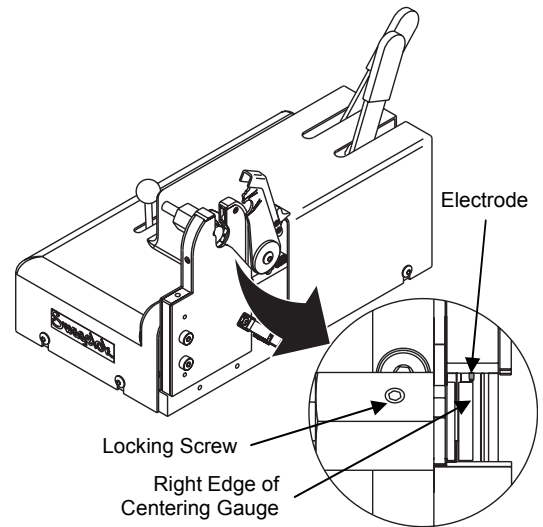


Figure 25 *Adjusting the Centering Gauge*

6. Insert the work piece into the other side of the fixture and butt it squarely against the end of the centering gauge. See Figure 26.

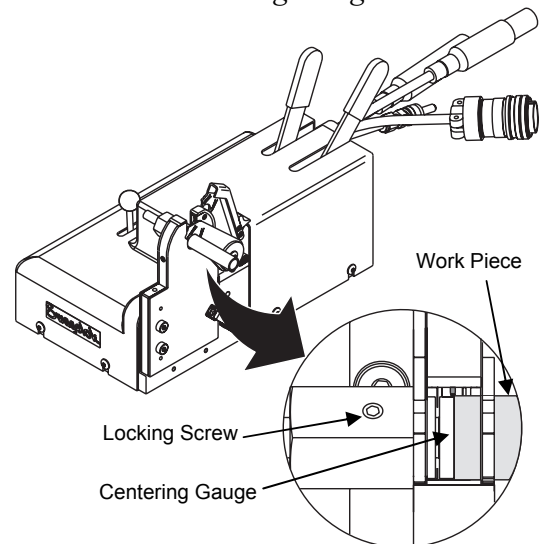


Figure 26 *Inserting the Work Piece*

7. Clamp the work piece into place. See Figure 27.
8. Remove the centering gauge and insert the other work piece to be welded, butting it up against the first work piece. Clamp the second work piece in place.

Note: At the start of every shift, or whenever the electrode is changed, ensure the centering gauge is re-centered.

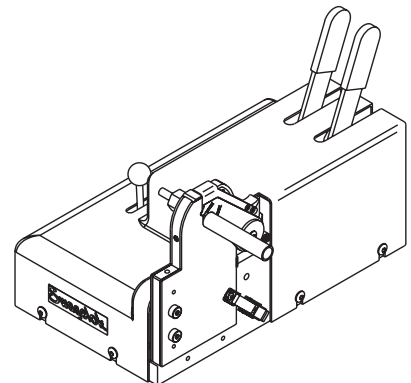


Figure 27 *Clamping the Work Piece*

Performing a Weld

Operate the weld head using the following parameters:

Series 8HPH

Shield gas flow rate std ft³/hr (std L/min)	10 to 15 ^① (4.7 to 7.1)
Prepurge and Postpurge minimum time in seconds	Continuous
Start Power	U-low, Low, Norm ^②
Maximum Recommended Average Amps	40 Amps

^① Set flow to higher rates when welding at high current rates.

^② M100-1 Power Supplies with serial numbers before 2802; D100-1 Power Supplies with serial numbers before 1425; D100-2 Power Supplies with serial numbers before 3267; or M100-2 Power Supplies with serial numbers before 3464 and ac arc start should use Low or U-low arc starts. All D-100-1A and D-75 units should use Low or U-low arc starts. Power supplies with dc arc starts should use Normal for wall thickness above 0.030 in.



Caution!
Do not use tack programs
or programs that include
tacks with the series 8HPH
weld head.



Caution!
Do not use step programs
with the series 8HPH
weld head.

Verify the Alignment of the Work

The series 8HPH weld head allows the user to verify work piece alignment while fixtured. To check the weld joint BEFORE initiating the weld sequence:

1. Open the arc shield by pushing down on the thumb tab. See Figure 28.
2. Release the tab to have the arc shield return to the closed position.
3. Program the power supply as instructed in the power supply manual.
4. Press PURGE to begin shielding gas flow. The shielding gas should remain on at all times when using the weld head.
5. Check the shielding gas flow rate. Proper shielding gas flow for this weld head is 10 to 15 std ft³/hr (4.7 to 7.1 std L/min).
6. Verify the arc shield is in the closed position. See Figure 29.



Caution!
Provide support to the purge tube and heavy work pieces to prevent an unacceptable weld, damage to the series 8HPH weld head, or both.

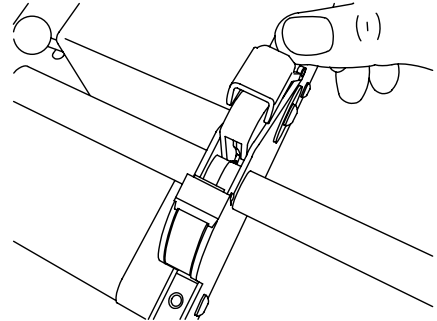


Figure 28 Arc Shield Open



WARNING!

CLOSE ARC SHIELD BEFORE BEGINNING WELD. USER COULD BE EXPOSED TO THE UV RAYS OF THE ARC IF THE ARC SHIELD IS NOT CLOSED DURING WELDING.



Caution!
Quality of the weld could be affected by an open arc shield during welding.

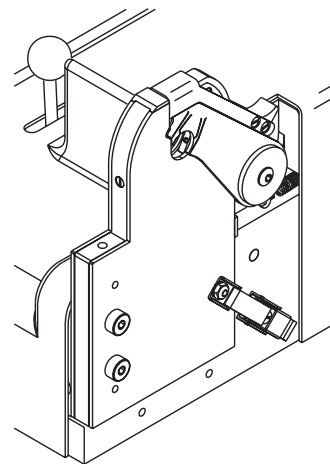


Figure 29 Arc Shield Closed

Changing the Side Plates

Side Plate Removal

1. Unhook the arc shield return spring that is holding the arc shield assembly in place. See Figure 30.

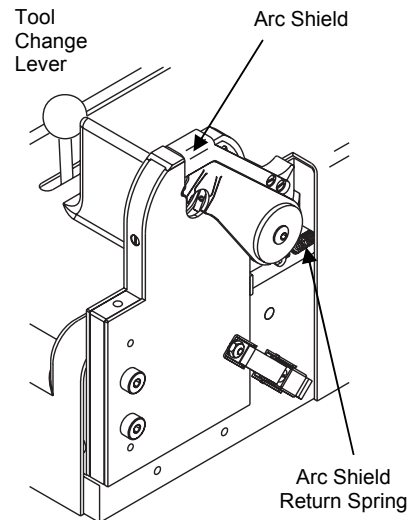


Figure 30 *Removing the Arc Shield Return Spring from the Movable Plate Assembly*

2. Push and hold the tool change lever back while pushing each handle to its rear-most position. Once each handle is back, release the tool change lever to lock the handles in the tool change position. See Figure 31.

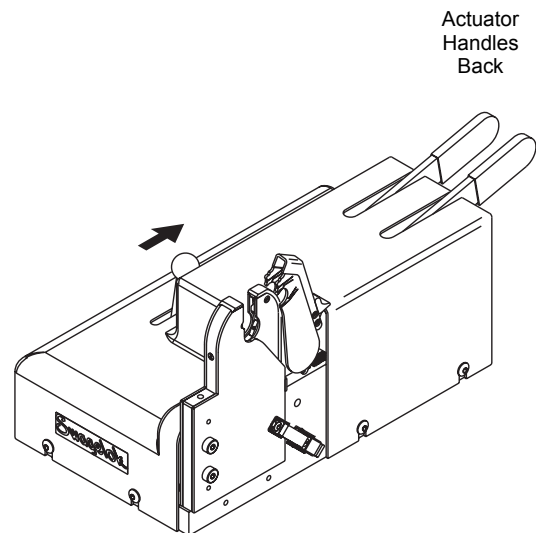


Figure 31 *Positioning the Weld Head for a Tool Change*

3. Remove the cap screw and washer. See Figure 32.

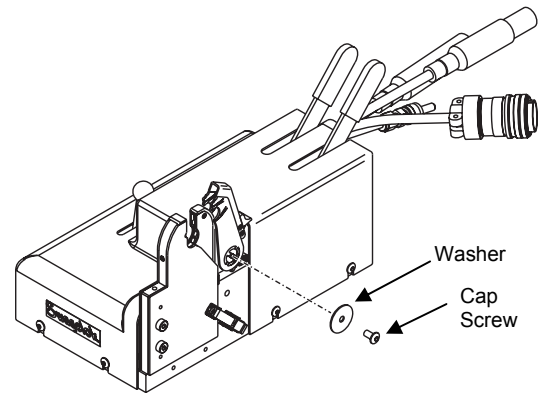


Figure 32 *Removing the Cap Screw and Washer*

4. Remove outer movable side plate, arc shield assembly, adapter hub, thrust bearing, and inner movable side plate. See Figure 33.
5. Set aside the inner and outer movable side plates. Keep the thrust bearing, adapter hub, and arc shield assembly nearby for reinstallation.

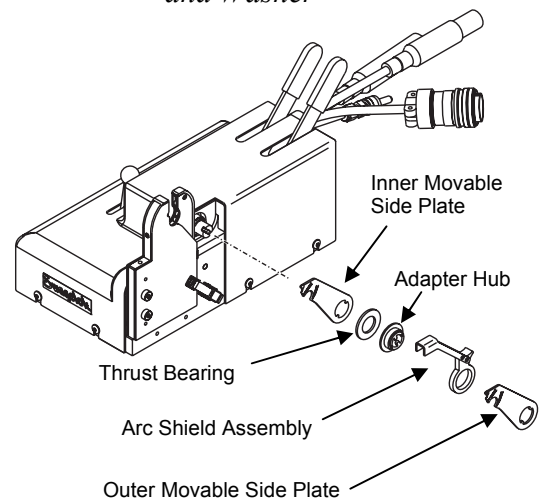


Figure 33 *Removing the Movable Side Plate Assembly*

6. Release the side plate latch.
7. Remove the two shoulder screws from the fixed side plate.
8. Pull the fixed side plate off of the fixture. See Figure 34.

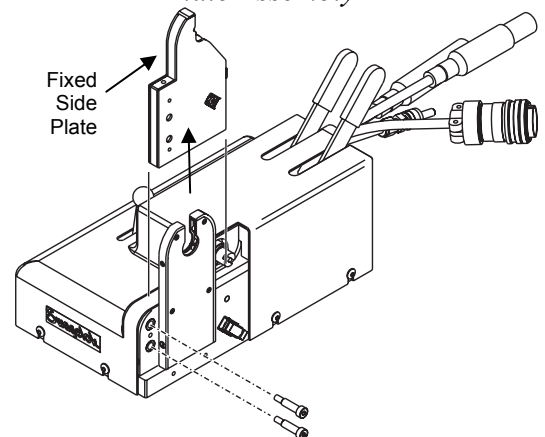


Figure 34 *Removing the Fixed Side Plate*

Side Plate Installation

1. Select the required side plate size.
2. Slide the fixed side plate over the weld head.
3. Insert the shoulder screws in the fixed side plate, but do not tighten.
4. Secure the side plate latch.
5. Secure the fixed side plate with screws. Tighten the fasteners 1/8 to 1/4 of a turn past finger tight. See Figure 35.

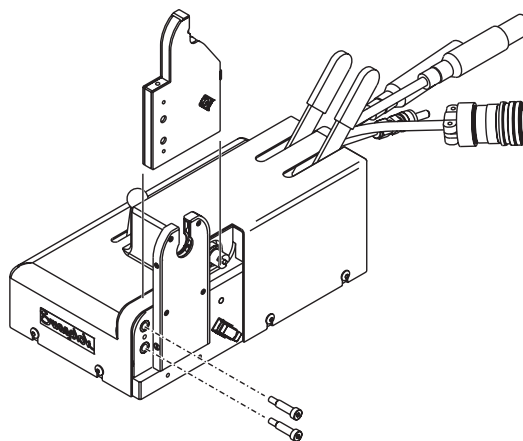


Figure 35 *Installing the Fixed Side Plate*

6. Align the keyed inner plate of the movable side plate with the notches in the shaft. See Figure 36.
7. Install the inner movable side plate.
8. Reinstall the thrust bearing and adapter hub on the shaft. Align them with the notched shaft. See Figure 37.
9. Install the arc shield assembly on hub.

Note: Make sure that the thrust bearing and adapter hub remain aligned.

10. Install the outer plate of the movable side plate over the notch of the adapter hub.

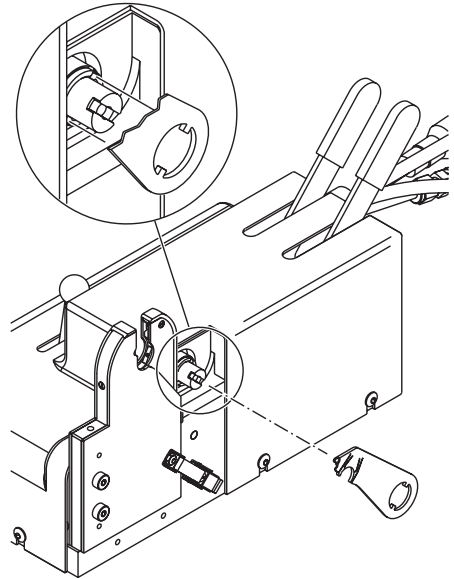


Figure 36 *Aligning the Keyed Inner Clamp with the Notched Shaft*

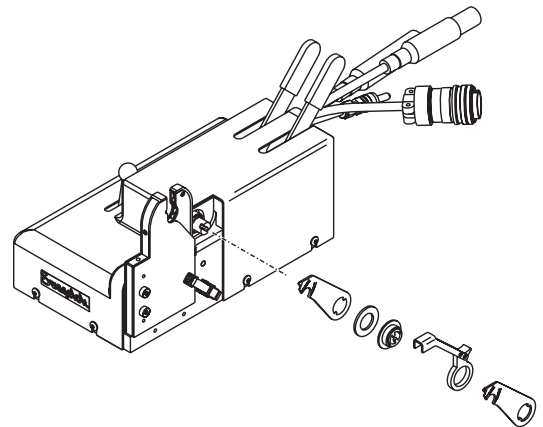


Figure 37 *Installing the Movable Clamp Assembly*

11. Reinstall the washer and the screw to secure the movable clamp assembly. Tighten the fasteners 1/8 to 1/4 of a turn past finger tight.

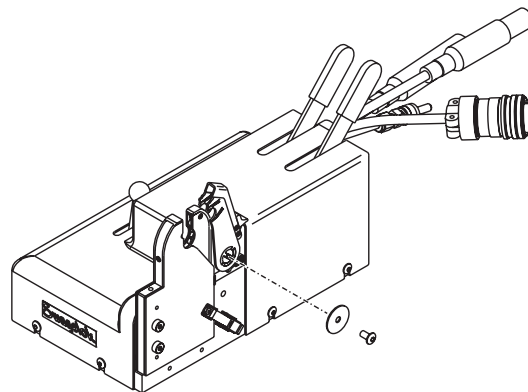


Figure 38 *Reinstalling Washer and Screw*

Note: The movable side plate assembly should be flush with the weld head when properly installed.

12. Push and hold the tool change lever back while pulling each actuator handle to the locked/closed position. Once each handle is forward, release the tool change lever.
13. Reattach the arc shield spring.

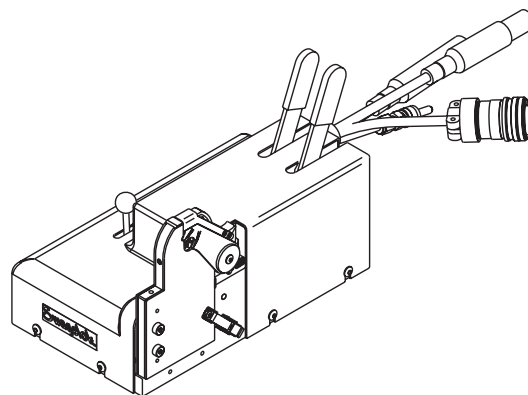


Figure 39 *Locking the Actuator Handles in the Operation Position*

Performing Daily Maintenance

To keep your Swagelok welding system equipment in proper working order, you must perform daily maintenance on the system components.



Caution!

Do not use lubricants inside the weld head.

Daily Fixture Maintenance

At the beginning of each workday:

1. Place the handles in the tool change position.
2. Use a stainless steel wire brush to clean the collet surfaces of the side plates that contact the work. See Figure 40.
3. Remove dirt, carbon and vapor deposits from the arc shield and movable side plates with a swab and isopropyl alcohol.

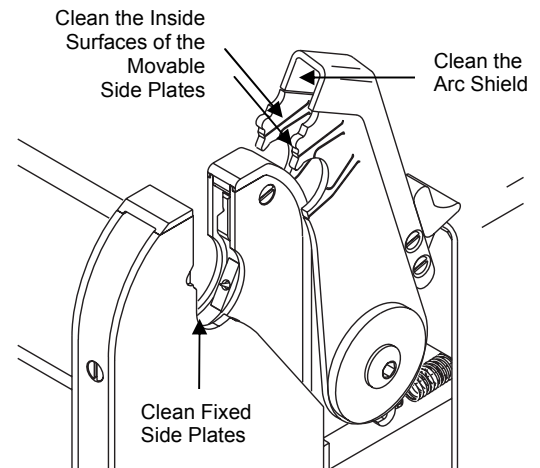


Figure 40 *Inspecting Side Plates and Arc Shield*

Daily Weld Head Maintenance

1. Remove dirt, carbon, and vapor deposits from the weld head rotor area with a clean, soft cloth or swab and a 90 % or greater isopropyl alcohol solvent.
2. Clean the exposed areas of the ceramic insert with isopropyl alcohol, and inspect for cracks or arcing damage. If the ceramic insert is damaged, follow the instructions in **Ceramic Insert Replacement** to replace it.
3. Incrementally jog the rotor and clean both sides of the rotor with a swab and isopropyl alcohol. See Figure 41.

Store the weld head in a clean, dry place at the end of each workday.

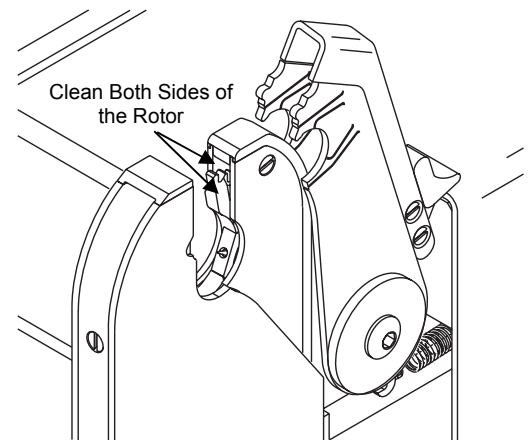


Figure 41 *Jogging and Cleaning Both Sides of the Rotor*

Performing Periodic Maintenance

As the weld head is repeatedly used, parts will begin to wear. Extensive testing has identified these baseline maintenance parameters, which can be used to approximate when certain tasks will need to be done.

This is dependent on the size of work pieces typically being welded with the machine.

For series 8HPH machines being used primarily to weld 1/4 in. (6.35 mm) or smaller tubing, periodic maintenance should be conducted every 10 000 welds.

For series 8HPH machines being used primarily to weld larger than 1/4 in. (6.35 mm) tubing, periodic maintenance should be conducted every 3 000 welds.

Replace all worn parts. Brush and curved disc springs must be ordered for periodic maintenance. For detailed part drawings and ordering information, see the **Parts Drawings** at the end of this manual. Spare parts are available through your authorized Swagelok sales and service representative.

Series 8HPH Cleaning and Inspection

Fixture Disassembly and Cleaning

1. Verify the rotor is in the home position.
2. Disconnect the unit from the power supply.
3. Loosen the eight screws holding the metal shroud in place.
4. Push the handles to the not locked/closed position.
5. Remove the tool change knob, by turning it counterclockwise.
6. Remove the metal shroud by lifting it straight up off of the base. See Figure 42.
7. Push the handles and tool change lever to the tool change position.
8. Remove the movable side plates, thrust bearing, adapter hub, and arc shield assembly.

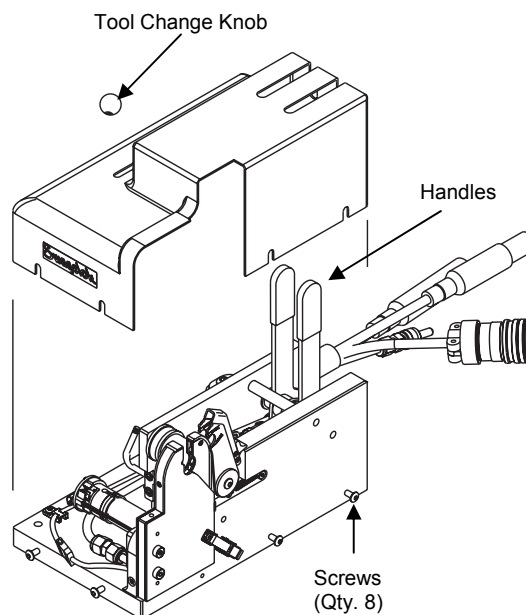


Figure 42 Removing the Metal Shroud

9. Remove the fixed side plate screws.
10. Release the fixed side plate latch.
11. Pull the fixed side plate off of the weld head. See **Changing the Side Plates** for detailed instructions.
12. Clean the surfaces of fixed side plate and the movable side plates that contact the work with a wire brush.
13. Wipe the surfaces of the fixed and movable side plates with isopropyl alcohol.
14. Remove the two locating shoulder screws and button head screw to remove the weld head assembly. See Figure 43.

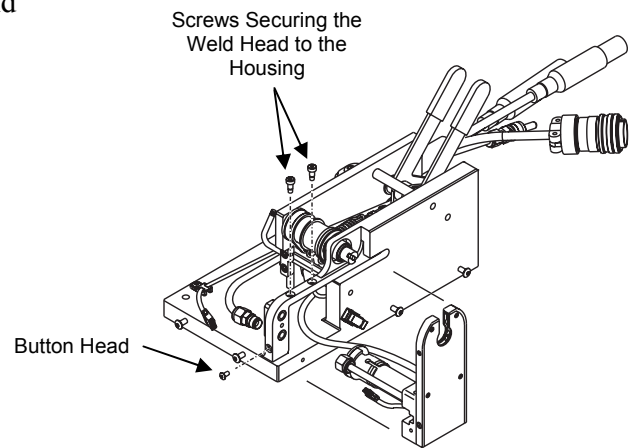


Figure 43 *Removing the Weld Head Assembly*

15. Disconnect the motor control connector.
16. Unscrew the nut and disconnect the purge gas line.
17. Pull the weld head assembly straight out from the base to access the power cable. See Figure 44.

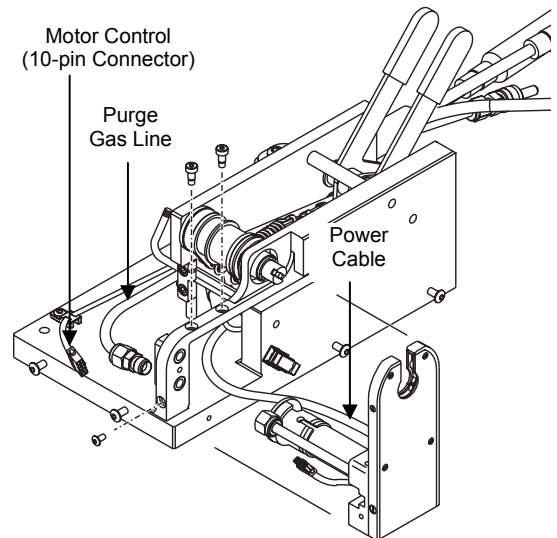


Figure 44 *Removing the Weld Head Assembly*

18. Disconnect the power cable from the plastic motor drive housing. See Figure 45.
19. Remove the weld head from the base.

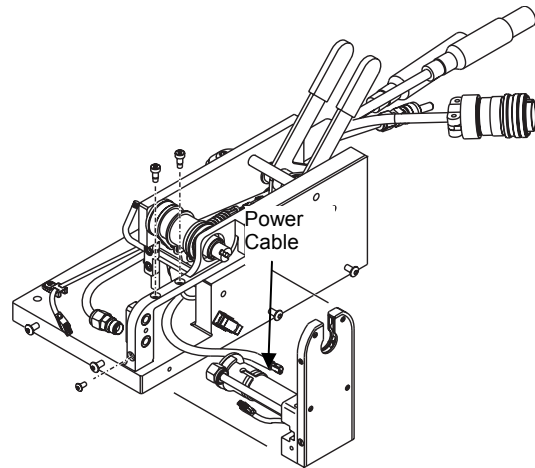


Figure 45 *Disconnecting the Power Cable*

Weld Head Disassembly and Cleaning

A new brush, ceramic insert, and curved disc springs will need to be ordered prior to performing this procedure. These items should be replaced during periodic maintenance.

1. Remove the screws securing the side shields of the weld head.
2. Loosen the two flathead screws at the top of the brush side cover to remove tension on the side shield pieces.
3. Lift the bottom of the side shield to unhook it from the metal insert. See Figure 46.
4. Wipe the surfaces of the side shields and covers with isopropyl alcohol.



WARNING!

DO NOT REPLACE PLASTIC FLATHEAD SCREWS WITH METAL FLATHEAD SCREWS. THIS COULD EXPOSE THE WELDING OPERATOR TO WELDING ARC START VOLTAGES

Loosen to Remove Tension to Allow Side Shield Removal

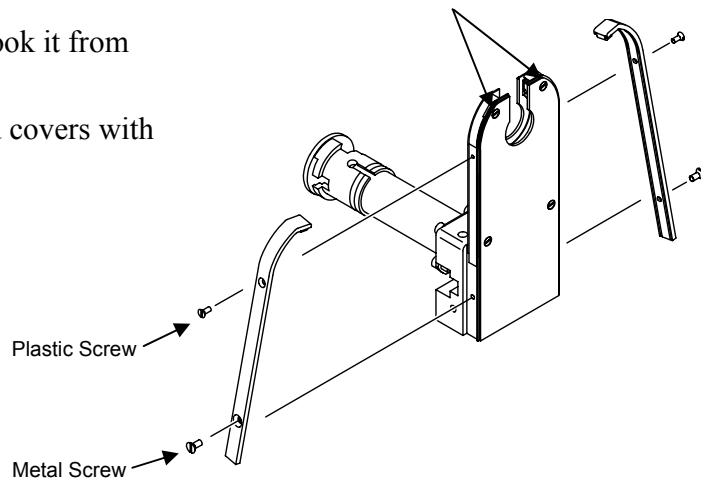


Figure 46 *Removing the Side Shields*

5. Remove the four plastic flathead screws securing the brush side cover. See Figure 47.
6. Clean the inside surface of brush side cover with isopropyl alcohol.

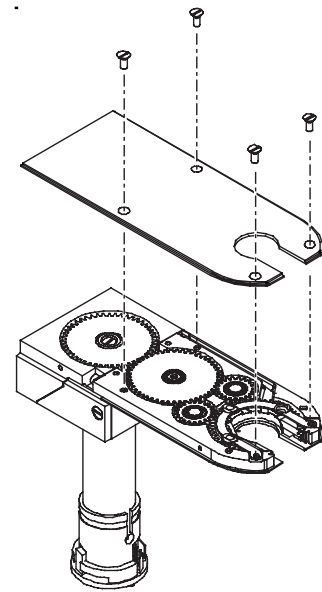


Figure 47 *Removing the Brush Side Cover*

7. Remove the brush, wave spring, and curved disc springs as shown in Figure 48 and discard. See the spare parts list in Table 3 for ordering information and contact your authorized Swagelok sales and service representative for replacement parts.

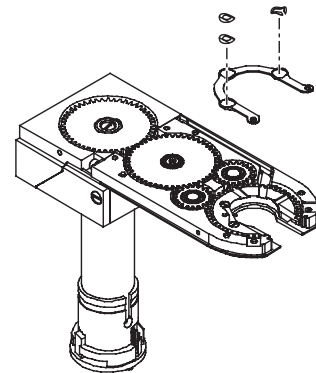


Figure 48 *Removing the Brush and Springs*

8. Remove the rotor. See Figure 49.

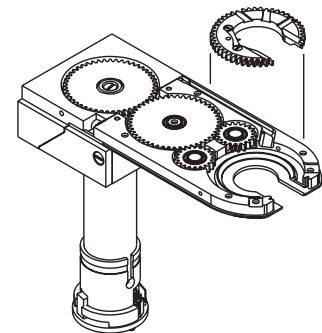


Figure 49 *Removing the Rotor*

9. Clean the teeth of the gears with the nylon brush included with the weld head. See Figure 50.
10. Clean the gear surfaces with a swab and isopropyl alcohol. See Figure 50.
11. Clean the track area of the weld head body with a swab and isopropyl alcohol.

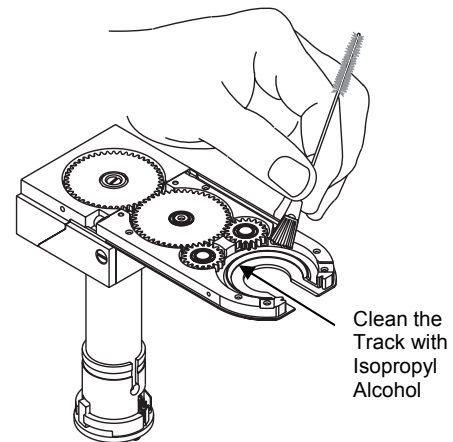


Figure 50 *Cleaning the Guideway of the Rotor Track with Isopropyl Alcohol*

12. Remove the electrode and ceramic insert and inspect around the electrode hole for damage.

Note: The ceramic insert is fragile and will crack if not handled properly.

13. Use a wire brush to eliminate discoloration. Replace the rotor if arcing damage prevents normal operation.
14. Clean the rotor with a swab and isopropyl alcohol.
15. Check the ceramic insert for damage. If it is damaged, replace it according to the **Ceramic Insert Replacement** instructions in this manual.

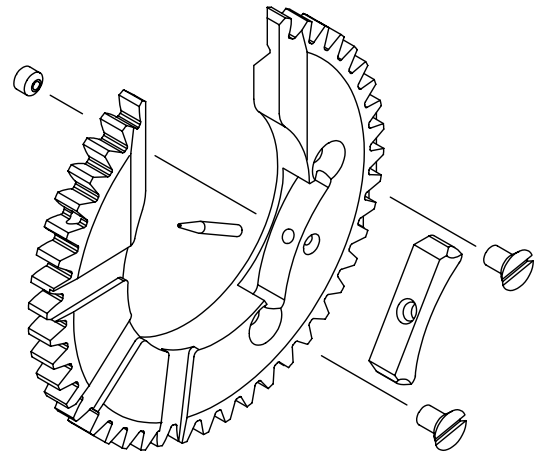


Figure 51 *Inspecting the Ceramic Insert for Damage*

Weld Head Reassembly

1. Replace the ceramic insert on the rotor, and secure it with flathead screws.
2. Install the new electrode, and secure it with a set screw. See Figure 52.

Note: If you are reassembling following a rotor jam indicated by the power supply, first reconnect the power supply and press **HOME**. Otherwise, after you have reassembled the weld head, the rotor will “remember” what position it was in when it jammed, and will not return to its proper home position. Disconnect the power supply before reassembly.



WARNING!

PINCH POINTS.

KEEP HANDS, LOOSE CLOTHING AND LONG HAIR AWAY FROM MOVING PARTS. SERIOUS INJURY CAN OCCUR.

3. Reposition the rotor in the drive gear insert of the weld head. Seat the rotor so that the track fits over the ridge of the insert. Make sure the rotor is flush with the ends of the rotor track.
4. Install a new brush, with the three pockets facing upward. Align the holes of the brush with the screw holes in the weld head body assembly.
5. Install the new wave spring and two curved disc springs into the brush pockets, making sure they are positioned as shown. See Figure 53.



Caution!

Be sure that the cover is lined up correctly or the springs will shift.

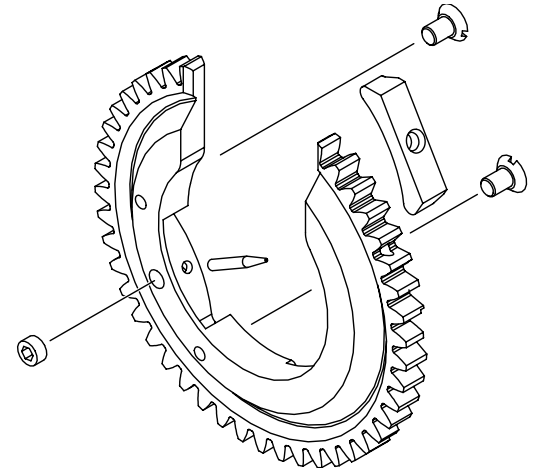


Figure 52 *Installing the Ceramic Insert*



Caution!

Do not use lubricants inside the weld head.

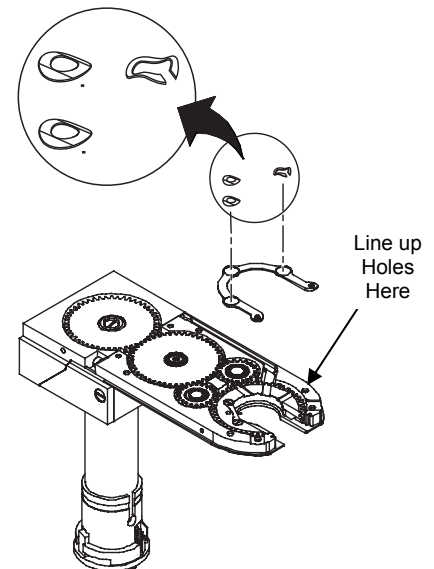


Figure 53 *Installing the Brush and Disc Springs*

6. Reinstall the brush side cover.
7. Insert the four plastic flathead screws to secure the brush side cover. See Figure 54.



WARNING!

DO NOT REPLACE PLASTIC FLATHEAD SCREWS WITH METAL FLATHEAD SCREWS. THIS COULD EXPOSE THE WELDING OPERATOR TO WELDING ARC START VOLTAGES.

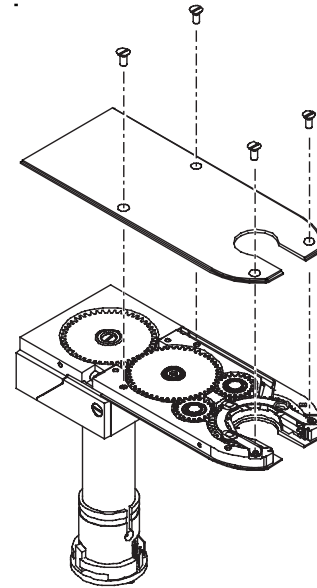


Figure 54 *Installing the Brush Side Cover*

8. Position the hooked end of the side shield into the recess at the top of the insert and clamp the side shield down. See Figure 55.
9. Reinstall the plastic flathead screws and metal flathead screws to secure the side shields.



WARNING!

DO NOT REPLACE PLASTIC FLATHEAD SCREWS WITH METAL FLATHEAD SCREWS. THIS COULD EXPOSE THE WELDING OPERATOR TO WELDING ARC START VOLTAGES.

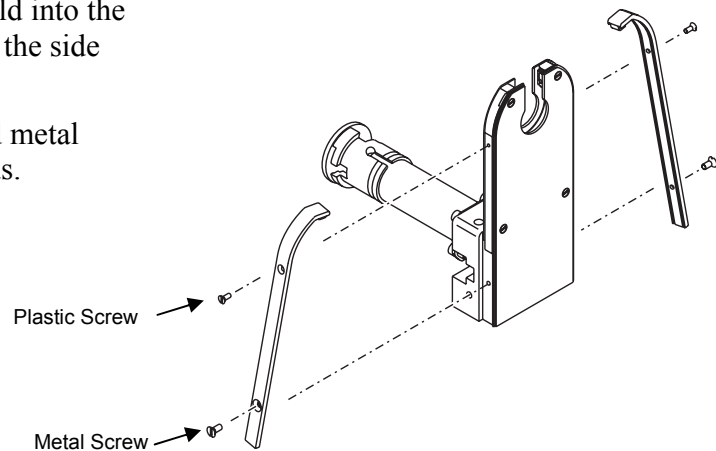


Figure 55 *Installing Side Shields*

10. Reconnect the power cable to the weld head.
11. Slide the weld head into the base and align the screw holes.
12. Insert the shoulder screws and the button head screw to secure the weld head in place.
13. Reconnect the motor control connector.
14. Reconnect the purge gas line. See Figure 56.

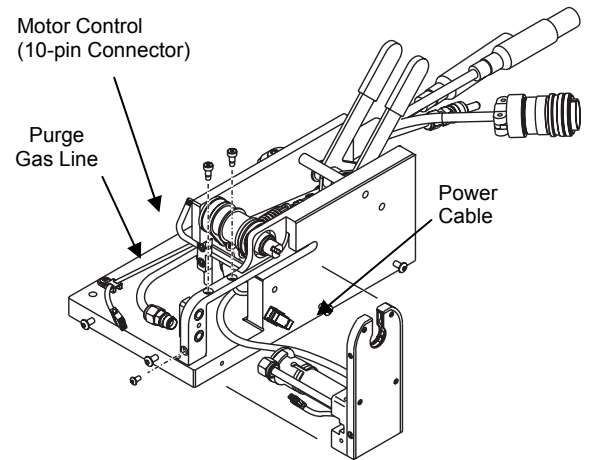


Figure 56 *Reconnect the Internal Cabling*

15. Slide the fixed side plate over the weld head assembly.
16. Secure the fixed side plate with two shoulder screws.
17. Reinstall the movable side plate assembly. See **Changing the Side Plates** for detailed instructions.
18. Move the handles from the tool change to the not locked/closed position. See Figure 57.

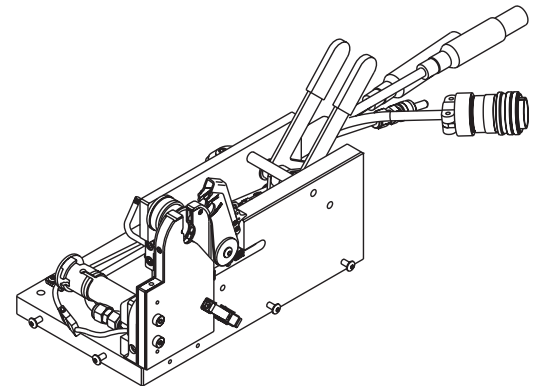


Figure 57 *Reinstalling the Side Plates*

19. Reinstall the metal shroud straight down.
20. Align the tool change lever with the housing slot using a screwdriver.
21. Tighten the eight screws that hold the metal shroud in position. See Figure 58.

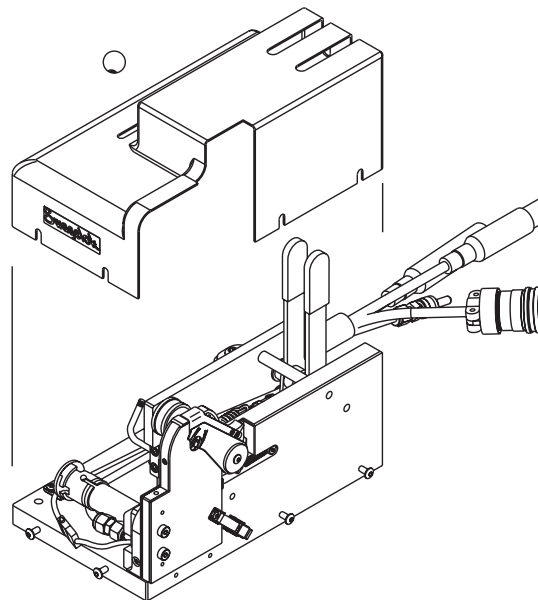


Figure 58 *Reinstalling the Metal Shroud*

22. Reinstall the tool change knob. See Figure 59.
23. Reconnect the power and turn on the power supply.
24. Press **HOME** to verify the rotor rotates smoothly and stops in home position.

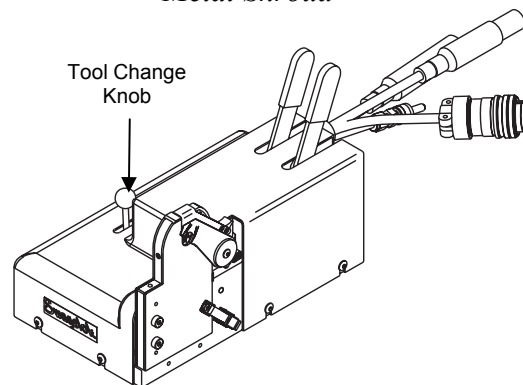


Figure 59 *Reinstalling the Tool Change Knob*

Ceramic Insert Replacement

1. Press **JOG** on the operator panel of the power supply until the first ceramic flathead screw is exposed.
Remove the first ceramic flathead screw.



Caution!

When removing screws, be careful not to drop them into the weld head gear assembly.

2. Press **JOG** on the operator panel of the power supply until the second ceramic flathead screw is exposed.
Remove the second ceramic flathead screw.
3. Press **JOG** on the operator panel of the power supply until the electrode is at the twelve o'clock position.
4. Remove the electrode set screw. See Figure 60.
5. Remove the electrode.
6. Remove the ceramic insert.

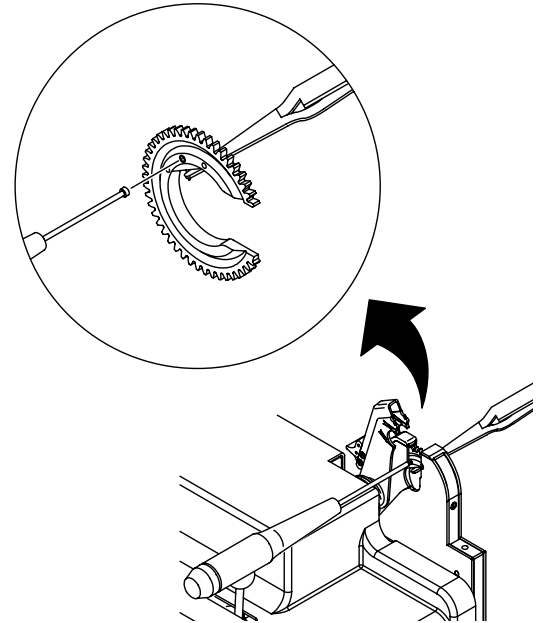


Figure 60 *Removing the Electrode*

7. Seat the new ceramic insert into the pocket in the track of the rotor, with the beveled edge facing out. See Figure 61.
8. Install a new electrode using the tweezers. Insert the electrode through the ceramic insulator and into the rotor to its full insertion depth. Make sure the sharp tip of the electrode is pointing out of the rotor hole.
9. Tighten the set screw sufficiently to prevent the electrode from falling out of the rotor.
10. Reinstall the two flathead screws to secure the ceramic insert.
 - a. Jog the rotor until you can install one of the screws.
 - b. Jog the rotor 300° until you can install the remaining flat head screw.



Caution!

Make sure that the ceramic and electrode screws are snug before operation.



Caution!

Excessive force can break the ceramic insert.

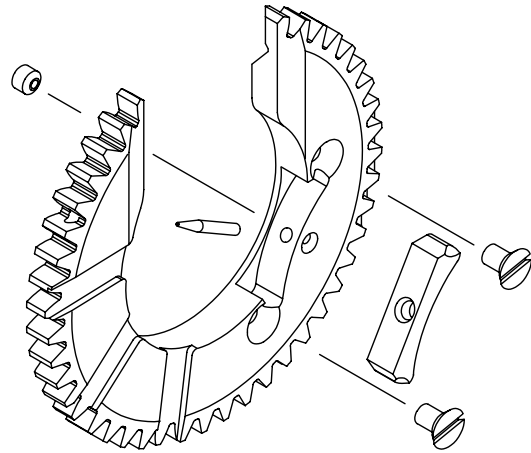


Figure 61 *Replacing the Ceramic Insert*

11. Press **HOME** to return the rotor to the home position.

Arc Shield Replacement

If there is physical damage to the arc shield, it should be replaced.

1. Remove the four flathead screws securing the arc shield to the movable clamp. See Figure 62.
2. Remove the old arc shield.
3. Install a new arc shield.
4. Reinstall the four flathead screws.

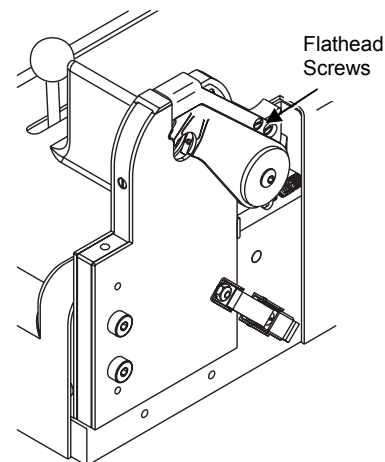


Figure 62 *Replacing the Arc Shield*

Work Support System

Note: *The work support is sold separately.*

Right/Left Work Support Instructions:

1. Attach the 8 in. work support rails to the series 8HPH weld head unit. See Figure 63.
2. Slide the base onto the rails.
3. Set the base to the desired position and secure with the knurled thumb screws.
4. Attach and set the right and/or left brace to the appropriate height on the base. Lock in place using the knurled thumb screw.

Note: *The right or left brace can be used with the V-notch for tubing or the flat side as needed.*

- For the left work support, use the plastic head screw for fine adjustments in height and for additional support as needed.
5. Additional work supports can be attached to the base of the left or right work supports as needed.
 6. An additional work support base can be used as a free standing work support. Attach the 3.5 in. work support rail to the top surface of the support base. Secure the right brace to the appropriate height and angle using the knurled thumb screw.

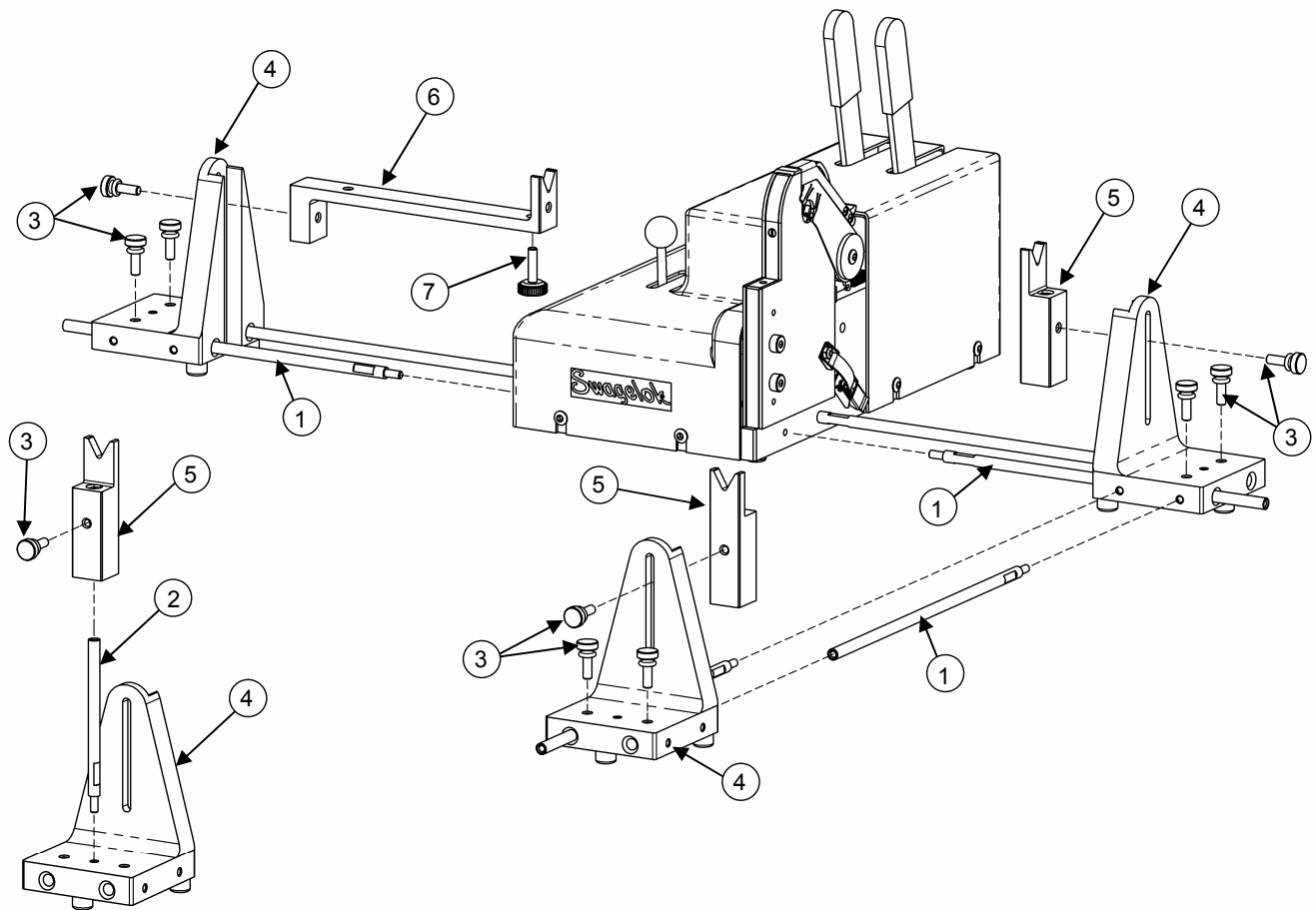


Figure 63 Work Support System

Ref. No.	Description	Ordering No.	Quantity Per Ordering Number		
			SWS-8HPH-WS (Full)	SWS-8HPH-WS-LT (Left)	SWS-8HPH-WS-RT (Right)
1	8 in. Work Support Rail	21634	4	2	2
2	3.5 in. Work Support Rail	21635	1	N/A	1
3	10-32 Knurled Thumb Screw	21636	6	3	3
4	Work Support Slide Base	21638	2	1	1
5	Work Support Right Brace	21640	1	N/A	1
6	Work Support Left Brace	21641	1	1	N/A
7	Plastic Head Screw	21642-.75	1	1	N/A
		21642-1.00	1	1	N/A
		21642-1.50	1	1	N/A

Parts Drawings

This section includes exploded assembly drawings and associated parts lists. These drawings are provided as a guide to identifying part names. For specific part ordering information, contact your authorized Swagelok sales and service representative.

The parts identified in this section include:

SWS-8HPH Weld Head Assembly

SWS-8HPH Fixture Assembly

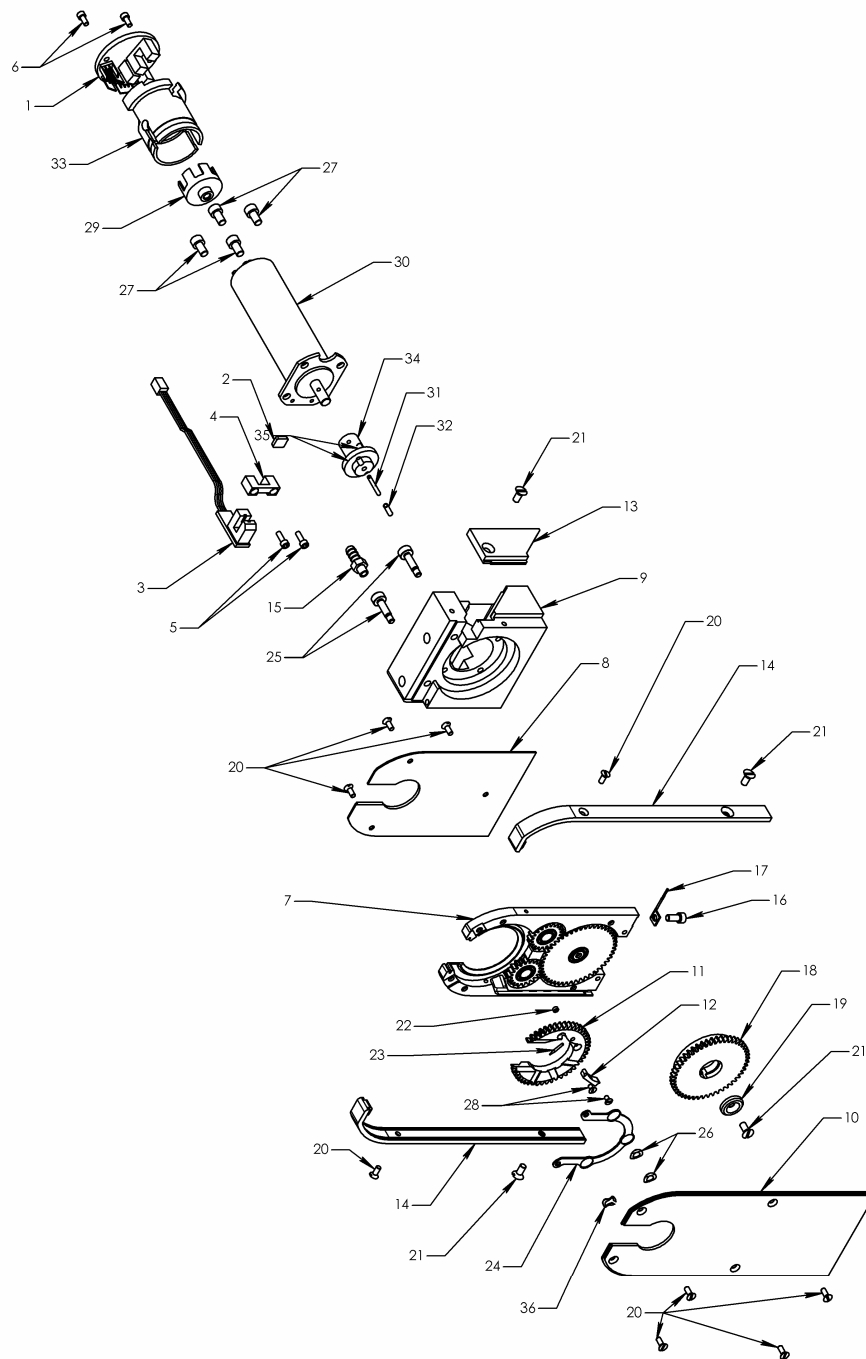


Figure 64 *SWS-8HPH Weld Head Assembly*

Table 3 SWS-8HPH Weld Head Assembly Parts List

Reference No.	Description	Ordering No.	Minimum Order Qty.
1	Encoder Circuit Board	N/A	N/A
2	Home Sensor Mount Shim	N/A	N/A
3	Home Sensor	N/A	N/A
4	Home Sensor Mount	N/A	N/A
5	SS Socket Head Cap Screw, 2-56 x 0.375 in.	N/A	N/A
6	SS Socket Head Cap Screw, 2-56 x 0.187 in.	N/A	N/A
7	Weld Head Body Assembly	21511	1
8	Cover, Motor Side	21502	1
9	Motor Mount	N/A	N/A
10	Cover, Brush Side	21501	1
11	Rotor	21513	1
12	Ceramic Insert	21514	1
13	Motor Mount Side Cover	N/A	N/A
14	Side Shield	21503	1
15	Purge Bayonet	N/A	N/A
16	SS Socket Head Cap Screw, 4-40 x 0.250 in.	13112	10
17	Quick-connect Tab	21520	1
18	Insulating Drive Gear	N/A	N/A
19	Drive Gear Retaining Washer	N/A	N/A
20	Plastic Flathead Screw, 2-56 x 0.219 in.	21518	10
21	S.S. Flathead Screw, 4-40 x 0.250 in.	21517	10
22	SS Electrode Set Screw, 3-48 x 0.063 in.	21522	10
23	Electrode	See 0 and 0	10
24	Brush	21507	1
25	SS Shoulder Screw 4-40 x 0.375 in.	21519	10
26	Curved Disc Spring	21508	10
27	SS Socket Head Cap Screw, 6-32 x 0.250 in.	N/A	N/A
28	SS Flathead Screw, 1-64 x 1.25 in.	21528	10
29	Encoder Wheel	N/A	N/A
30	Motor	N/A	N/A
31	Drive Coupler Pin	N/A	N/A
32	Drive Coupler Pin Sleeve	N/A	N/A
33	Sleeve Sensor Mount	N/A	N/A
34	Drive Coupler	N/A	N/A
35	SS Dowel Pin, 0.093 x 0.125 in.	N/A	N/A
36	Wave Spring	21530	1

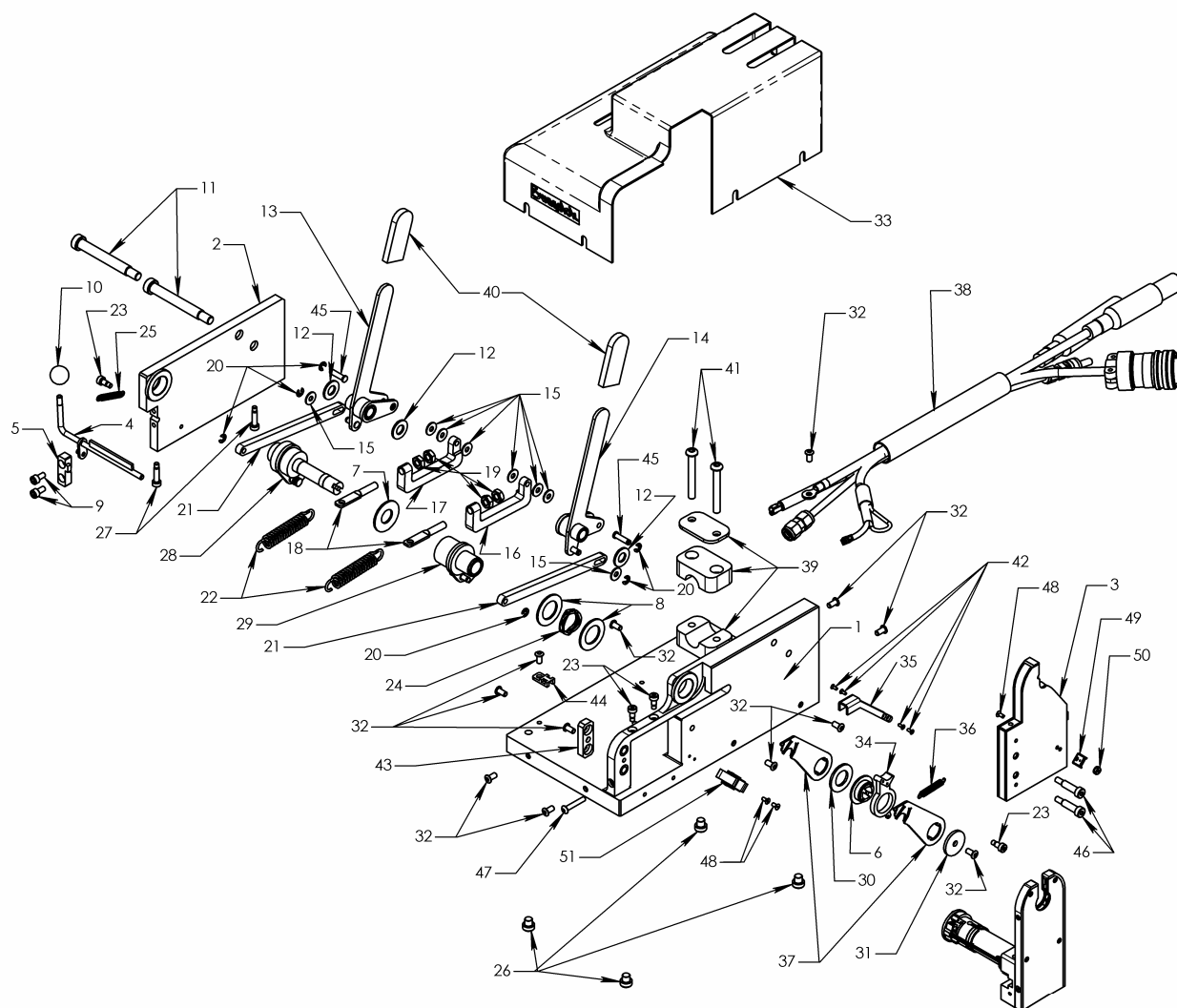


Figure 65 SWS-8HPH Housing

Table 4 SWS-8HPH Housing

Reference No.	Description	Ordering No.	Minimum Order Qty.
1	Top Platform	N/A	N/A
2	Outer Support Plate	N/A	N/A
3	1/8 in. Fixed Side Plate	21539-02	1
	1/4 in. Fixed Side Plate	21539-04	1
	3/8 in. Fixed Side Plate	21539-06	1
	1/2 in. Fixed Side Plate	21539-08	1
	3 mm Fixed Side Plate	21539-3MM	1
	6 mm Fixed Side Plate	21539-6MM	1
	8 mm Fixed Side Plate	21539-8MM	1
	10 mm Fixed Side Plate	21539-10MM	1
	12 mm Fixed Side Plate	21539-12MM	1
4	Clamp Stop Assembly	N/A	N/A
5	Clamp Block	N/A	N/A
6	Adapter Hub	21560	1
7	1.25 in. OD ; 0.56 in. ID Bronze Washer	N/A	N/A
8	1.25 in. OD ; 0.75 in. ID Bronze Washer	N/A	N/A
9	10-32 ; 0.500 in. Socket-head Cap Screw	N/A	N/A
10	10-32 ; 0.69 in. dia Black Knob	21568	1
11	5/16-18 3/8 ; 2.5 in. LG Socket-head Shoulder Screw	N/A	N/A
12	0.750 in. OD ; 0.375 in. ID Thrust Washer	N/A	N/A
13	Left Handle Assembly	N/A	N/A
14	Right Handle Assembly	N/A	N/A
15	Nylon Washer, 3/16 in. dia	N/A	N/A
16	Left Spring Link	N/A	N/A
17	Right Spring Link	N/A	N/A
18	Spring Eyelet	N/A	N/A
19	1/4-20 Hex Nut	N/A	N/A
20	E-clip	N/A	N/A
21	Strut	N/A	N/A
22	Actuator Extension Spring	N/A	N/A
23	8-32 3/16 x 1/4 in. LG Socket-head Shoulder Screw	21581	10
24	Wave Coil Spring	N/A	N/A
25	Clamp Stop Extension Spring	N/A	N/A
26	Fixture Feet	21577	10
27	8-32 5/8 x 3/16 in. LG Socket-head Shoulder Screw	N/A	N/A
28	Actuator Assembly Outer Clamp	N/A	N/A
29	Actuator Assembly Inner Clamp	N/A	N/A
30	Needle Roller Thrust Bearing	21591	1
31	1.000 in. OD 10 Fender Washer	21593	1
32	10-32 x 3/8 in. Button-head Cap Screw	21592	10
33	Metal Shroud	21588	1
34	Arc Shield Hub	21596	1
35	Arc Shield	21594	1
36	Arc Shield Return Spring	21580	1

Reference No.	Description	Ordering No.	Minimum Order Qty.
37	1/8 in. Movable Side Plate	21543-02	1
	1/4 in. Movable Side Plate	21543-04	1
	3/8 in. Movable Side Plate	21543-06	1
	1/2 in. Movable Side Plate	21543-08	1
	3 mm Movable Side Plate	21543-3MM	1
	6 mm Movable Side Plate	21543-6MM	1
	8 mm Movable Side Plate	21543-8MM	1
	10 mm Movable Side Plate	21543-10MM	1
	12 mm Movable Side Plate	21543-12MM	1
38	Motor Wire Harness	N/A	N/A
39	Strain Relief Assembly	N/A	N/A
40	Handle Cover	21601	10
41	S.S Button Head Screws, 1/4-20 x 2.00 in.	N/A	N/A
42	Flathead S.S. 2-56 x 0.188 in. Screws	21606	10
43	Backing Plate	N/A	N/A
44	Cable-tie Mount	N/A	N/A
45	Spring Link Pin	N/A	N/A
46	10-24 1/4 x 3/4 in. LG Socket Head Shoulder Screw	21626	10
47	S.S. Button Head Screws, 8/32 x 1.00 in.	21607	10
48	S.S. Flathead Screw, 4-40 x 0.250 in.	21517	10
49	Latch Catch	21643	1
50	4-40 Star Lock Nut	13103	1
51	Latch	11520	1
52 (Not Shown)	1/8 in. Centering Gauge	SWS-8HPCG-02	1
	1/4 in. Centering Gauge	SWS-8HPCG-04	1
	3/8 in. Centering Gauge	SWS-8HPCG-06	1
	1/2 in. Centering Gauge	SWS-8HPCG-08	1
	3 mm Centering Gauge	SWS-8HPCG-3MM	1
	6mm Centering Gauge	SWS-8HPCG-6MM	1
	8 mm Centering Gauge	SWS-8HPCG-8MM	1
	10 mm Centering Gauge	SWS-8HPCG-10MM	1
	12 mm Centering Gauge	SWS-8HPCG-12MM	1

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.